SIX SIGMA FOR SCRAP COST REDUCTION IN REMANUFACTURING INDUSTRY

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Specially dedicated to:

My beloved husband and son,

Mohd Zulkarnain bin Ab. Razak and Aiman Danish bin Mohd Zulkarnain

for their love and support

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ABSTRACT

This project entails the adoption of Six Sigma Methodology in remanufacturing industry. The improvement project is carried out at a service and repair company for electronic product. Six Sigma is a set of quality management tools and strategies, including statistical methods used for process improvement by identifying and eliminating the causes of defects and reducing variability occurs in manufacturing and other businesses process. The Six Sigma DMAIC methodology consists of five phases which are Define (D), Measure (M), Analyse (A), Improve (I), and Control (C) respectively. This case study focuses on implementing Six Sigma methodologies into the motherboard repair process in to identify and minimize the variation exists in the process and subsequently reducing the associated scrap cost. As known, the original assembly process of motherboard is comparatively straightforward. However, the repair process of malfunction motherboard which requires troubleshooting of problem and replacement of electronic devices can be much more complicated and often end-up scrapping the whole set of motherboard itself. Realizing this great challenge, the DMAIC tools are mounted in this study to solve the underlying problem stated. The objective of the project is to reduce the overall scrap rate and to increase the sigma level of the motherboard repair process. The existing scrap rate is 45.89% and process sigma level is 1.84σ. It is proven that the method and tools chosen have successfully reduced the scrap rate to 18.60% and increased the process sigma level to 2.46σ in three months period after the improvement took place. This result indicates that Six Sigma methodology is also applicable in remanufacturing industry as good as in forward manufacturing industry.

ABSTRAK

Projek ini melibatkan penggunaan Metodologi *Six Sigma* dalam industri pembuatan semula. Projek perbaikan ini dijalankan di sebuah syarikat servis dan membaiki produk elektronik. *Six Sigma* adalah satu set alat pengurusan kualiti dan strategi, termasuk kaedah statistik yang digunakan untuk perbaikan proses dengan mengenal pasti dan menghapuskan punca-punca kecacatan dan mengurangkan kebolehubahan yang berlaku dalam industri pembuatan dan juga dalam sektor perniagaan yang lain. Metodologi *Six Sigma DMAIC* terdiri daripada lima fasa utama iaitu *Define (D), Measure (M), Analyse (A), Improve (I),* dan *Control (C).* Kajian kes ini memberi tumpuan kepada perlaksanaan metodologi *Six Sigma* dalam proses pembaikan *motherboard* untuk mengenal pasti dan mengurangkan variasi yang wujud dalam proses dan seterusnya mengurangkan kos sekerap. Seperti yang diketahui, proses pemasangan *motherboard* pada asasnya tidaklah begitu rumit. Walau bagaimanapun, proses pembaikan *motherboard* rosak yang memerlukan pengenalpastian jenis kerosakan dan penggantian alat-alat elektronik boleh menjadi lebih rumit dan sering berakhir dengan pelupusan keseluruhan *motherboard* itu sendiri. Menyedari cabaran yang besar ini, metodologi DMAIC telah digunakan dalam kajian ini untuk menyelesaikan masalah yang dinyatakan. Objektif projek ini adalah untuk mengurangkan kadar sekerap secara keseluruhan dan meningkatkan tahap sigma proses pembaikan motherboard. Kadar sekerap yang sedia ada ialah 45.89% dan tahap sigma proses adalah 1.84σ. Terbukti bahawa kaedah dan metodologi yang dipilih telah berjaya mengurangkan kadar sekerap kepada 18.60% dan meningkatkan tahap sigma proses kepada 2.46σ dalam tempoh tiga bulan selepas aktiviti perbaikan berlaku. Keputusan ini menunjukkan bahawa metodologi *Six Sigma* juga boleh diaplikasikan dalam industri pembuatan semula sebagaimana aplikasinya yang meluas dalam industri pembuatan biasa.